a third optical coupler inserted between said first and second optical amplifiers.

30. The optical switch according to claim 1, further comprising a third optical coupler having an input-side first branch connected to an output of said first optical amplifier and an output-side branch connected to an input of said second optical amplifier.

31. The optical switch according to claim 30, further comprising:

a third optical amplifier whose output is connected to an input-side of said third optical coupler.--

REMARKS

A Petition (and fee) for one month extension of time and an Excess Claim Fee Payment Letter are attached hereto for excess claims.

Claims 1-31 are all the claims presently pending in the application. New claims 26-31 have been added to more completely define the invention. Applicant gratefully acknowledges the Examiner's indication that claims 7-11 would be allowable if rewritten in independent form. Claims 7-11 have been rewritten accordingly, to place them into condition for immediate allowance.

Claims 18-19, 21-23, and 25 stand rejected upon informalities (e.g., 35 U.S.C. § 112, second paragraph), and claims 1-6 and 12-25 stand rejected on prior art grounds.

With respect to the prior art rejections, claims 1-3, 5-6, 16, 18, 23, and 25 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Sugaya (U.S. Patent No. 5,812,710). Claims 4, 12, and 15 stand rejected under 35 U.S.C. § 103(a) as being

unpatentable over Sugaya in view of Luo, et al. (U.S. Patent No. 6,008,932). Claims 13-14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sugaya in view of Terahara (U.S. Patent No. 6,097,535). Claim 17 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Sugaya in view of Tsuda, et al. (U.S. Patent No. 6,038,063). Claim 19 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Sugaya in view of Kinoshita (U.S. Patent No. 6,342,965). Claims 20 and 24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Glance (U.S. Patent No. 5,764,821) in view of Sugaya. Claims 21-22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kosaka (U.S. Patent No. 6,094,296).

These rejections are respectfully traversed in view of the following discussion.

Attached hereto is a marked-up version of the changes made to the specification and claims by the present Amendment. The attached page(s) is captioned "**Version with Marking to Show Changes Made**".

It is noted that the claim amendments herein are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims, or for any statutory requirements of patentability.

Further, it is noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

I. THE CLAIMED INVENTION

Applicant's invention, as disclosed and claimed, for example by independent claim 1,

is directed to a an optical switch for transmitting or shutting down an input light signal in accordance with a set switching state.

The optical switch includes first and second optical amplifiers connected in cascade. In a non-limiting exemplary embodiment, when EDFs (11 and 12; it is noted that all reference numerals used herein are for the Examiner's clarity and understanding only, and not for limiting the claims in any way) and pumping sources (31 and 32) are used as the first and second optical amplifiers, the switching is accomplished by switching on or off the pumping sources (31 and 32) in accordance with control signals supplied from a control circuit (300). One input light signal can be dropped through a first optical branch (51) located on the input side of the optical switch, while another input light signal can be added through a second optical branch (53).

Thus, an important feature of the inventive arrangement is a first control circuit for outputting first and second control signals for switching a gain of the first and second optical amplifiers. Further, the route of light can be switched using the switching function of the first optical amplifier.

With the invention, it is possible for a single gate switch to obtain a high gain and a high power without having an adverse influence on transmission properties.

Independent claims 20 and 21 recite similar limitations.

Such features are not taught or suggested by any of the prior art of record, either alone or in combination.

II. THE 35 U.S.C. §112, SECOND PARAGRAPH REJECTION

Regarding the §112, second paragraph, rejection, claims 21-23 have been amended in a manner believed fully responsive to all points raised by the Examiner.

Further, Applicant submits that with regard to claims 18-19, to increase pumping power, a wavelength-multiplexing method or a polarization multiplexing method is widely used in industry, and is believed to be extremely well-known to those of ordinary skill in the art. Thus, the pumping source(s) can either output light which is polarization-multiplexed or wavelength-multiplexed, as noted in the specification at page 12, lines 7-10.

In view of the foregoing, reconsideration and withdrawal of this rejection are respectfully requested.

III. THE PRIOR ART REJECTIONS

A. The §102(b) Rejection based on Sugaya et al.

Sugaya fails to anticipate or render obvious the claimed invention. Indeed, Sugaya's invention is directed to "gain equalization." Therefore, it fails to have the object, purpose, function or structure for shutting down the amplifiers, as in the claimed invention, which allows the switching of the gain of the first and second amplifiers.

Sugaya discloses an apparatus for optical equalization and amplification. The Examiner refers to Figure 23 and alleges that Sugaya discloses a first optical amplifier 122, a second optical amplifier 123 and a first control circuit 127 for outputting first and second control signals for switching a gain of the first and second amplifiers. Applicant respectfully submits that this is incorrect.

That is, the purpose of the Sugaya's invention is to keep constant an output level of optical fiber amplifying unit. To achieve this object, Sugaya uses a variable optical attenuation unit which is controlled by a feedback signal. Indeed, referring to column 18, lines 37-42, Sugaya discloses that "[t]he CPU controlled circuit 127, which includes CPU, control the light intensity of the excitation light generated by the light sources 124, 125, and 126 based on the optical level of each channel detected by the photodiodes 113-1-113-n." Thus, this passage makes clear that Sugaya is performing only an attenuating function, not switching the gain of first and second amplifiers, as in the claimed invention.

Thus, independent claims 1, 20, and 21 which recite this and other features is not taught or suggested by Sugaya.

Additionally, even assuming arguendo that Sugaya may incidentally show two amplifiers connected in series, such an alleged serial connection of the two amplifiers is not the same as in the present invention. Indeed, the present invention aims to switch the route of light by using switching function of the first optical amplifier. No such function (or gain switching function of claims 1, 202, and 21) is taught or suggested (let alone performed) by Sugaya. Thus, new claims 26-28 are clearly patentable over Sugaya.

As for claim 5, Sugaya's optical coupler located between optical amplifiers has a different structure and purpose from the present invention.

The Examiner asserts that Sugaya discloses "shutting down of the first and second amplifiers" (col. 18, lines 37-42). However, looking closer at column 18, lines 37-42 of Sugaya, such a passage does not appear to disclose any "shutting down" of the first and second amplifiers. Again, such a passage merely discloses that the CPU controlled circuit

127, which includes CPU, controls the light intensity of the excitation light generated by the light sources 124, 125, and 126 based on the optical level of each channel detected by the photodiodes 113-1-113-n." Thus, this passage is irrelevant to "shutting down" the first and second amplifiers and clearly fails to teach or suggest such a feature.

Thus, Sugaya's invention is directed to "gain equalization." Therefore, it fails to have the object, purpose, function or structure for shutting down the amplifiers (or switching a gain thereof), as in claims 1, 20, and 21.

Hence, the present invention is clearly patentable over Sugaya.

Further, regarding the §103 rejections discussed in turn below, none of the secondary references teaches or suggests the claimed invention and fails to make up for the above-mentioned deficiencies of Sugaya. Indeed, the other references are cumulative to Sugaya and have the same purpose as Sugaya, as discussed below.

B. The §103 Rejection Based on Sugaya et al. in view of Luo et al.

Regarding this rejection, first Applicant submits that one of ordinary skill in the art would not have been motivated to make the Examiner's urged combination.

That is, Sugaya and Luo are each directed to very different problems (different from that of the present invention) and attempts to solve them in very disparate way.

Indeed, Sugaya is directed to providing an amplifier for keeping a constant optical output level and equalizing output levels of a plurality of wavelengths elements (e.g., see column 2, lines 36-40 of Sugaya). In contrast, Luo is directed to preventing degradation in a system's bit error rate due to gain transients resulting from the deletion or addition of one or

more channels due to, for example, channel failure or bursty traffic. None of these specific problems or solutions is affirmatively encountered (or addressed) by the present invention.

Thus, given the different problems and very different solutions of Sugaya and Luo, there would have been no motivation or reason to combine the references, absent impermissible hindsight.

Morever, even assuming arguendo that the references would have been combined, Luo fails to make up for the deficiencies of Sugaya discussed above.

That is, Sugaya has been discussed above. Specifically, Sugaya's invention is for keeping constant an output level of optical fiber amplifying unit, which uses a variable optical attenuation unit controlled by a feedback signal. Sugaya does not teach or suggest a switching of the gain. Moreover, Sugaya does not teach or suggest switching the route of light by using a switching function of the first optical amplifier. Luo adds nothing to Sugaya, and indeed is merely cumulative to Sugaya.

Thus, claims 4, 12, and 15 are patentable over the Examiner's urged combination of Sugaya and Luo.

C. The §103 Rejections based on Sugaya et al. in view of Terahara or Tsuda, or Kinoshita

Regarding claims 13-14, 17, and 19, the Examiner secondarily relies on Terahara, Tsuda or Kinoshita, respectively. However, these references are clearly deficient in making up for the shortcomings of Sugaya discussed above.

Again, the purpose of the Sugaya's invention is to keep constant an output level of

optical fiber amplifying unit, which uses a variable optical attenuation unit which is controlled by a feedback signal.

However, the invention uses a gain switching function of a first control circuit for outputting first and second control signals for switching a gain of the first and second optical amplifiers. Hence, the invention can switch the route of light signals by using a switching function of the first optical amplifier.

Terahara, Tsuda, and Kinoshita have the same purpose as Sugaya and disclose nothing about switching of the gain of first and second optical amplifiers.

Thus, claims 13-14, 17, and 19 are patentable over Sugaya in view of any of Terahara, Tsuda or Kinoshita, respectively.

D. The §103 Rejection based on Glance in view of Sugaya et al.

Regarding claims 20 and 24, Glance discloses a large capacity local access network. As admitted by the Examiner, Glance does not disclose, teach or suggest an optical switch comprising first and second optical amplifiers and a control circuit.

The Examiner relies on Sugaya for such a teaching. However, even assuming arguendo that Sugaya would have been combined with Glance, as discussed above, Sugaya fails to teach or suggest the limitations discussed above and recited in claims 20 and 24.

Indeed, Sugaya's invention is directed to "gain equalization." Therefore, it fails to have the object, purpose, function or structure for shutting down the amplifiers, as in the claimed invention, which allows the switching of the gain of the first and second amplifiers.

Again, the first control circuit 127 fails to output first and second control signals for

switching a gain of the first and second amplifiers. Gain equalization in Sugaya is far different from a function of "gain switching" as in the claimed invention.

That is, the purpose of Sugaya's invention is to keep constant an output level of optical fiber amplifying unit. To achieve this object, Sugaya uses a variable optical attenuation unit which is controlled by a feedback signal. Indeed, as discussed above in reference to column 18, lines 37-42, Sugaya is performing only an attenuating function, not a switching of the gain of first and second amplifiers, as in the claimed invention.

Hence, even if Sugaya discloses an optical switch comprising first and second optical amplifiers and a control circuit, there is no teaching or suggestion of the control circuit switching a gain of the first and second optical amplifiers. .

Thus, independent claims 20 and 24 which recite the above and other features is not taught or suggested by Glance in view of Sugaya.

E. The §103 Rejection based on Kosaka et al.

Regarding claims 21 and 22, Kosaka discloses an optical amplification apparatus. The Examiner refers to column 6, lines 11-27 of Kosaka and asserts that Kosaka teaches a control circuit (e.g., 14 in Figure 4) which is allegedly for outputting first and second control signals for switching a gain of the first and second optical amplifiers.

However, control circuit 14 is for adjusting the deviation of optical power between wavelengths. Indeed, column 6, lines 12-17 of Kosaka disclose that:

...if the gain of the optical amplifier unit 9 is determined by setting an excitation light amount of the excitation light source 11 such that the optical output power of light at wavelength is +10 dBm, and excitation light amounts of the excitation light sources 22b, 22c in the optical gain adjusters 17b, 17c are adjusted to determine the gain of light at wavelengths λ_2, λ_3 in accordance with the setting of the optical amplifier unit 9, the output power of the light at the respective wavelengths and the deviation of optical power between the wavelengths can be arbitrarily adjusted. The control for adjusting the excitation light amounts outputted by the excitation light sources 11, 22b, 22c, is performed by the control unit 14.

This operation by the control circuit is irrelevant to switching a gain of the amplifiers. Indeed, as is clear Kosaka clearly fails to disclose, teach or suggest an optical switch comprising a first control circuit for outputting first and second control signals for switching a gain of the first and second optical amplifiers.

Indeed, Kosaka is somewhat similar to Sugaya's invention directed to "gain equalization." Therefore, it fails to have the object, purpose, function or structure for shutting down the amplifiers, as in the claimed invention, which allows the switching of the gain of the first and second amplifiers. Indeed, the control circuit 14 fails to output first and second control signals for switching a gain of the first and second amplifiers. The control for adjusting the excitation light amounts outputted by the excitation light sources 11, 22b, 22c, in Kosaka is far different from a function of "gain switching" as in the claimed invention.

As discussed above, Kosaka is merely performing an attenuating function, not a switching of the gain of first and second amplifiers, as in the claimed invention.

Thus, independent claims 21 and 22 which recite the above and other features is not

taught or suggested by Kosaka.

Hence, turning to the clear language of the claims, there is no teaching or suggestion of independent claim 1 (nor the other independent claims 20 and 21 which recite substantially similar limitations) which recites "*[a]n optical switch comprising:*

a first optical amplifier;

a second optical amplifier connected in cascade to said first optical amplifier; and

a first control circuit for outputting first and second control signals for switching a gain of said first and second optical amplifiers" (emphasis Applicant's).

For the reasons stated above, the claimed invention is fully patentable over the cited references.

III. Formal matters and Conclusion

In response to the Examiner's failure to consider the Information Disclosure Statement filed April 19, 2000 (with certification), the Examiner is respectfully requested to consider to the extent possible and to make of record the Japanese reference submitted in the IDS and listed on the PTO-1449 form. Applicant notes that, for some reason, the Examiner crossed-out the Japanese references listed on the PTO-1449 Form returned with the Examiner's Communication dated April 24, 2002.

However, Applicant fully complied with M.P.E.P. §609 and 37 C.F.R. §§1.97-1.99 regarding the submission of foreign language documents.

Indeed, in the April 19, 2000, IDS, it was noted in IDS that the reference was cited in a Japanese Office Action in the counterpart application. In full compliance with M.P.E.P.

§609 and 37 C.F.R. §§1.97-1.99, a translation of the relevant portions of the foreign Action/Search Report indicating the degree of relevance of the foreign reference found by the foreign Examiner in the foreign Action/Search Report was in fact submitted. Again, this is in full compliance with M.P.E.P. §609 (e.g., see right-hand column of page 600-122, of Original Eighth Edition, dated August 2001) and 37 C.F.R. §§1.97-1.99.

Further, Applicant notes that there is no requirement in 37 C.F.R. or the M.P.E.P. for a "complete English translation" of a foreign language reference in order for the Examiner to consider the reference.

Hence, the Examiner is requested to consider and initial the PTO-1449 Form listing the reference. For the Examiner's convenience, a duplicate copy of the PTO-1449 Form is submitted herewith.

To overcome the Examiner's objection to the specification, the specification has been amended.

To overcome the Examiner Rule 83(a) objection to the drawings, submitted herewith is a proposed drawing correction, marked in red, to Figure 6. No new matter has been added.

Specifically, regarding "a second optical filter" recited in claim 14, the specification discloses that "[t]he number of the optical isolators to be used and the positions in which they are inserted are not limited to the example alone....."(p.9, lines 7-9). Thus, the second optical filter has been added in the Figure 6 to overcome the Rule 83(a) objection.

As for "wavelength-division multiplexing" and "polarization multiplexing", these items are indicated in claims 18 and 19, respectively. Referring to Figure 11, reference numerals 31, 32, 36, 37 are representative of these two claimed limitations. It is noted that

the specification indicates that "[t]he method of increasing the output optical power is not limited to this method alone. For example, the lights outputted from a plurality of pumping sources may be wavelength-division multiplexed or polarization multiplexed, whereby the output optical power can be increased." (p.12, lines 6-10). Thus, the claimed subject matter is believed to be shown sufficiently to allow one of ordinary skill in the art to understand the claimed subject matter.

As for "a signal light detector for detecting whether or not a signal light is inputted to the first optical amplifier" as recited in claim 23, this limitation is represented by reference numeral 41 (e.g., "optical monitor") in Figure 15. Further, the specification (p. 18, lines 27-28) discloses that "[t]he optical monitors whether the signal light is present or absent." It is noted that the signal light detector has a function substantially equivalent to the optical monitor, for detecting whether or not a signal light is inputted to the first optical amplifier.

As for "an optical network in which a plurality of optical nodes are connected through an optical fiber transmission lines, and wherein each of the plurality of optical nodes comprises an optical switch", as recited in claims 24 and 25, Figure 12 is believed to clearly show an optical switching system including a plurality of EDFA gates and a multiplexer and demultiplexer.

As for claim 25, Figures 15 and 16 clearly show an optical switching system including a controller which can deliver an AIS signal.

In view of the foregoing, Applicant submits that claims 1-31, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above

application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to the Assignee's Deposit Account No. 50-0510.

Respectfully Submitted,

Date: 8/26/02

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VERSION WITH MARKING TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Please replace the paragraph beginning at line 16 of Page 14, with the following:

The signal light of wavelength 1550 nm is inputted to the EDF 11 through the optical transmission line 100. On the other hand, the pumping light of wavelength 1480 nm, which is outputted from the pumping source [31] 33 to the optical transmission line 105, is inputted to the EDF 11 through the optical branch 52. The signal light is amplified by the EDF 11 and then inputted to an optical wavelength multiplexer 303.

IN THE CLAIMS:

2. (Amended) The optical switch according to claim 1, wherein said first and second optical amplifiers each comprise a semiconductor optical fiber amplifier.

3. (Amended) The optical switch according to claim 1, wherein said first and second optical amplifiers each comprise an optical fiber amplifier.

7. (Amended) [The optical switch according to claim 1, further comprising:] An optical switch comprising:

a first optical amplifier;

a second optical amplifier connected in cascade to said first optical amplifier; and

a first control circuit for outputting first and second control signals for switching a gain of said first and second optical amplifiers;

a third optical coupler inserted between said first and second optical amplifiers, said

third optical coupler having an input-side first branch connected to an output of said first optical amplifier and an output-side branch connected to an input of said second optical amplifier; and

a third optical amplifier whose output is connected to an input-side second branch of said third optical coupler.

15. (Amended) The optical switch according to claim 1, wherein said first optical amplifier comprises an optical fiber amplifier, and said optical fiber amplifier comprises:

an erbium-doped optical fiber; and

a pumping source for generating a pumping light whose wavelength is in a 980 nm wavelength region to be inputted to said erbium-doped optical fiber.

21. (Amended) An optical switch for a wavelength-division multiplexed light which is obtained by wavelength-division multiplexing a plurality of light signals, said optical switch comprising:

an optical wavelength demultiplexer for demultiplexing said wavelength-division multiplexed light into said plurality of light signals and outputting each of said plurality of light signals to each of a plurality of branches;

a plurality of first optical couplers, each being connected to each of said plurality of branches;

a plurality of first optical amplifiers, each having an input connected to an output of each of said plurality of first optical couplers;

a plurality of second optical couplers, each having an input-side first branch connected to the output of each of said plurality of first optical amplifiers;

a plurality of second optical amplifiers coupled to said second optical couplers to receive an input from said plurality of first optical amplifiers;

at least one first optical wavelength multiplexer whose input is connected to each of output-side branches of some of said plurality of second optical couplers;

at least one [second] third optical amplifier whose input is connected to the output of said at least one first optical wavelength multiplexer; and

a control circuit for outputting first and second control signals for switching a gain of said first and second optical amplifiers.

23. (Amended) The optical switch according to claim 1, further comprising:

a signal light detector for detecting whether or not a signal light is inputted to said first optical amplifier and then outputting the result of the detection as a detect signal[; and],

[a second] said first control circuit for providing said first and second optical amplifiers with control signals for shutting down said first and second optical amplifiers, when said detect signal is inputted to said second control circuit to indicate that said signal light is not inputted to said first optical amplifier.

24. (Amended) An optical network in which a plurality of optical nodes are connected through [an] optical fiber transmission lines,

wherein each of said plurality of optical nodes comprises an optical switch as defined

in claim 20.

Please add the following new claims:

–26. The optical switch according to claim 1, wherein said first optical amplifier switches a route of light.

27. The optical switch according to claim 20, wherein said first optical amplifier switches a route of said light signals.

28. The optical switch according to claim 21, wherein said first optical amplifier switches a route of said light signals.

29. The optical switch according to claim 1, further comprising:

a third optical coupler inserted between said first and second optical amplifiers.

30. The optical switch according to claim 1, further comprising a third optical coupler having an input-side first branch connected to an output of said first optical amplifier and an output-side branch connected to an input of said second optical amplifier.

31. The optical switch according to claim 30, further comprising:

a third optical amplifier whose output is connected to an input-side of said third optical coupler.--